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Environmental Restoration Project
Standard Operating Procedure

for:

Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers

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Revision Log

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Table of Contents

1.0 PURPOSE 4
2.0 SCOPE 4
3.0 TRAINING 4
4.0 DEFINITIONS 4
5.0 RESPONSIBLE PERSONNEL 4
6.0 BACKGROUND AND PRECAUTIONS 5
7.0 EQUIPMENT 6
8.0 PROCEDURE 7
9.0 REFERENCES 10
10.0 RECORDS 10
11.0 ATTACHMENTS 10

Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers

1.0 PURPOSE

This SOP describes the process for collecting soil and sediment samples using either split-spoon samplers or Shelby tube samplers at the Los Alamos National Laboratory (Laboratory) ER Project.

2.0 SCOPE

This SOP is a mandatory document and shall be implemented by all ER Project participants when implementing soil and sediment sample collection processes for the ER Project

3.0 TRAINING

3.1 All users of this SOP are trained by reading the procedure, and the training is documented in accordance with QP-2.2 (and is documented appropriately in the ER Project Training Database [http://erinternal.lanl.gov/Training/Training.asp]).

3.2 The **Field Team Leader** (FTL) will monitor the proper implementation of this procedure and ensure that relevant team members have completed all applicable training assignments in accordance with QP-2.2.

4.0 DEFINITIONS

4.1 *Shelby tube*— A single-piece metal tube, of thin gauge, which is forcefully driven into the soil or sediment at the bottom of a borehole to collect an undisturbed subsurface soil or sediment sample.

4.2 *Split-spoon sampler*— A multi-piece sampler which is threaded onto the end of a drill rod or hand auger and forcefully driven into the soil or sediment at the bottom of a borehole to collect an undisturbed subsurface soil or sediment sample.

4.3 *Site-Specific Health and Safety Plan (SSHASP)*—A health and safety plan that is written for a specific site or ER-related field activity and that has been approved by an ER Project health and safety representative. This document contains information specific to the project, including scope of work, relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment [PPE]) and hazard mitigation.

4.4 *Focus Area Data Steward*—A data steward participates as a member of the ER Project Data Analysis and Assessment Team. Members of this team provide expertise in data management activities as they pertain to one or more ER-related scientific disciplines; i.e., chemistry, statistics, hydrology, geology, environmental science, engineering, and/or computer science. The major responsibility of the data stewards is to ensure the quality accuracy, and completeness of the ER Project technical database.

4.5 *Sample Management Office*—The SMO is part of the Field Support Facility and is the organization responsible for receiving and shipping RE Project samples. SMO staff handle the receipt, coordination, and temporary records management of ER Project analytical data record packages.

5.0 BACKGROUND AND PRECAUTIONS

Note: This SOP is to be used in conjunction with an approved SSHASP. Also, consult the SSHASP for information about, and use of, all PPE.

5.1 Background

5.1.1 Split-Spoon Sampler

5.1.1.1 A split-spoon sampler is used to take subsurface soil or sediment samples by forcefully driving the sampler into the soil or sediment at the bottom of a borehole. Samples may be retrieved along the entire length of the borehole to obtain an unbroken record of the subsurface layers, or samples may be retrieved at selected intervals.

5.1.1.2 The split spoon is threaded onto the end of the drill rod and lowered to the bottom of the boring by a heavy steel cable connected to the drilling mast. The sampler is forced into the soil by a drive weight that is dropped repeatedly onto the drive head located at the top of the drill rod. In some designs, the split-spoon sampler is threaded onto a drill stem and placed inside a hollow stem auger. As the auger is rotated and lowered, the split-spoon sampler is advanced along with the drill bit, using the drill rig's drive weight.

5.1.1.3 The sampler is driven into the soil to a depth about 6 in. shorter than the length of the sampler itself. Split-spoon samplers are available in a variety of lengths and diameters for use in a variety of applications. Occasionally, bedrock or extremely compacted sediments are encountered which make further advance of the sampler extremely difficult or impossible without damage to the sample. This condition is known as *refusal* and is defined as a "penetration of less

than 1 foot for 100 blows" (a blow is the act of striking a drive rod with a drive weight). Six inches for 50 blows is also commonly recognized as refusal. Upon refusal, either the borehole should be abandoned or the sampler should be removed and replaced by a drill bit.

5.1.1.4 Split-spoon sampling can also be performed with a hand auger. The split spoon is threaded onto the end of a hand-driven drill rod, in place of the auger/bit. The split spoon is advanced into the borehole by manually turning the hand auger. In all other respects, hand-augured split-spoon sampling is identical to hydraulically driven split-spoon sampling.

5.1.2 Shelby Tube Sampler

The Shelby tube is a similar type of sampling apparatus. The split spoon is a multi-piece sampler; the Shelby tube is a single-piece metal tube of thinner gauge. Like the split spoon, soil is forced in to the Shelby tube and stored inside. However, because the Shelby tube is typically advanced hydraulically, it allows the capture of a relatively undisturbed sample. Due to its thinner walls and sharp cutting edge, the Shelby tube requires much less effort to push into the soil. Care must be taken not to compress the soil sample by forcing the tube in deeper than its own length.

5.2 Precautions

This procedure is limited to the activities of collecting soil and sediment samples for (1) field monitoring and laboratory analysis of concentrations of hazardous and radioactive constituents, (2) soil/sediment physical characteristics, or (3) geologic logging. This SOP does not address drilling activities, removal of time-sensitive geologic analytical samples, core documentation, lithologic description, packaging of core material, or temporary storage of borehole materials.

6.0 RESPONSIBLE PERSONNEL

6.1 Field Team Leader

6.2 Field Team Member

6.3 ER Project Personnel

6.4 Focus Area Data Steward

6.5 Sample Management Office Staff

6.6 Subcontractor

7.0 EQUIPMENT

7.1 A checklist of suggested equipment and supplies needed to implement this procedure is provided in Attachment A.

8.0 PROCEDURE

Note: Subcontractors performing work under the ER Project's quality program may follow this standard operating procedure (SOP) sample collection from split-spoon samplers and Shelby tube samplers or may use their own procedure(s) as long as the substitute meets the requirements prescribed by the ER Project Quality Management Plan, and has been approved by the Environmental Restoration (ER) Project's Quality Program Project Leader (QPPL) before the commencement of the designated activities.

Note: ER Project personnel may produce paper copies of this procedure printed from the controlled-document electronic file located at http://erinternal.lanl.gov/home_links/Library_proc.htm. However, it is their responsibility to ensure that they are trained to and utilizing the current version of this procedure. The author may be contacted if text is unclear.

Note: Deviations from SOPs are made in accordance with QP-4.2, Standard Operating Procedure Development and documented in accordance with QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities.

8.1 Preoperation Activities

8.1.1 Coordinate sampling efforts with a Focus Area Data Steward and the Sample Management Office (SMO). They will give guidance regarding sample containers and preservation.

8.1.2 Label all bottles and acquire all necessary documentation (ER-SOP-1.02, Sample Containers and Preservation, and ER-SOP-1.04, Sample Control and Field Documentation).

8.1.3 Ensure that all sampling equipment has been properly decontaminated, and assemble the sampler (ER-SOP-1.08, Field Decontamination of Drilling and Sampling Equipment).

8.1.4 Note the exact location and location identification number of the hole where the sample has been collected in the field notebook.

8.1.5 If possible, photograph the location.

8.1.6 Mark the location with stakes that include the location identification number.

8.2 Sampling

Note: The sample collection strategy and rationale must be discussed, understood, and fully documented in the field notebook and/or daily logs

8.2.1 Collect the split-spoon sampler or Shelby tube sampler and place the sampler on a secure bench, table, or rack.

8.2.2 If a split-spoon sampler was used, proceed to step 6.2.3. If a Shelby tube sampler was used, do one of the following:

- immediately cap the ends of the Shelby tube, tape the caps to ensure retention, and submit the entire tube to the laboratory

OR

- extrude the sample into a clean stainless-steel bowl and package the sample as necessary.

Note: For volatile organic compound (VOC) samples, either the tube must be sealed and shipped intact, or an En Core sampler—and associated sample container—must be used to extract the VOC sample(s), according to the current version of the En Core technical manual/operating instructions, prior to capping the Shelby tube.

8.2.3 If a split-spoon sampler was used, separate the split-spoon sampler tube (a flat-blade screwdriver is useful), exposing either the sample or brass liners.

Note: If VOC analysis is required, liners may be used with the split-spoon sampler to collect the VOC sample.

8.2.3.1 If liners were used, run a knife between the liners to separate the tube.

- Immediately seal the ends of the liner with Teflon film and cap the ends.
- The field team member will log the sample information in the field notebook or borehole log at this time.
- The geologist will also record the borehole identification number, run number, depth interval, and percent recovery (as appropriate).

8.2.3.2 If liners were not used, immediately collect the VOC sample from the open split-spoon sampler using the En Core sampling tool and associated sample container.

8.2.3.3 For composite samples (where VOCs are not an analytical parameter), using a decontaminated stainless steel spoon (or other appropriate sampling tool), collect small amounts of

soil or sediment from several discrete points within the split-spoon sampler.

8.2.3.4 Place the soil or sediment in a decontaminated stainless steel or plastic bucket or a plastic ziploc bag.

8.2.4 Mix the soil or sediment several times until the material is well mixed and homogeneous. Sampling points for the composite sample may be selected randomly, at regular intervals, or based on visual inspection. Alternatively, place the entire core into a decontaminated stainless steel or plastic bucket and mix until the sample is homogenized.

8.2.5 Field duplicates may be collected in one of two ways:

- compositing the soil in a decontaminated stainless-steel or plastic bucket (a *composited* field duplicate)

OR

- sampling from an adjacent location (a *collocated* field duplicate).

Collocated field duplicates are to be collected from adjacent liners. Follow the site-specific sampling plan and document the duplicate collection process in the field notebook and in daily logs.

8.3 Postoperation Activities

8.3.1 Decontaminate the outside of the sample containers.

8.3.2 Bag the samples in a Ziploc bag.

8.3.3 Place the samples in a cooler at the sampling site. The cooler should contain ice as specified by the site-specific sampling plan.

8.3.4 Following each sampling event, wash the split-spoon sampler with high-purity laboratory detergent and double-rinse the components with deionized water, methanol, 0.1N nitric acid, and/or other rinse solution as appropriate, or as specified in the site-specific sampling plan.

8.3.5 In the laboratory, brass liners and Shelby tube samplers should be cleaned prior to use. In the field, they should be rinsed with deionized water prior to use.

8.4 **Lessons Learned**

During the performance of work, ER Project personnel shall identify, document, and submit lessons learned in accordance with QP-3.2, Lessons Learned, located at: http://erinternal.lanl.gov/home_links/Library_proc.htm.

9.0 REFERENCES

The following documents have been cited within this procedure:

- QP-2.2, Personnel Orientation and Training
- QP-3.2, Lessons Learned
- QP-4.2, Standard Operating Procedure Development
- QP-4.4, Record Transmittal to the Records Processing Facility
- ER-SOP-1.02, Sample Containers and Preservation
- ER- SOP-1.04, Sample Control and Field Documentation
- ER-SOP-1.08, Field Decontamination of Drilling and Sampling Equipment
- En Core sampling technical manual/operating instructions

10.0 RECORDS

The **Field Team Leader** is responsible for submitting the following records (processed in accordance with QP-4.4) to the Records Processing Facility.

10.1 Daily Activity Log

10.2 Chain of Custody/Request for Analysis

10.3 Sample Collection Log

10.4 Borehole Log (if developed)

11.0 ATTACHMENTS

Attachment A: Equipment and Supplies Checklist for Sample Collection Using Split-Spoon and Shelby Tube Samplers (1 page)

Equipment and Supplies Checklist for Sample Collection Using Split-Spoon and Shelby Tube Samplers

____ Split-spoon drive sampler

____ Brass liners and sealing materials (plastic end caps, Teflon seals, non-adhesive silicon or Teflon tape, Ziploc bags)

____ Shelby tube sampler

____ Work table surface

____ Knife/blade

____ Sampling tools

____ Buckets

____ Decontamination supplies

____ Deionized water

____ Chain of Custody/Request for Analysis forms

____ Any PPE that is listed or required in the SSHASP

____ Any additional supplies listed in associated procedures, as needed

____ En Core sampling tool and appropriate sample containers*

____ Current version of En Core sampling technical manual/operating instructions (from SMO)*

* For VOC samples only